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OBSERVATIONS ON THE INFECTION OF CRATAEGUS BY GYMNOSPORANGIUM¹

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An interesting growth of the red cedar (*Juniperus virginiana*) and hawthorns (*Crataegus* spp.) is found on the slopes of Tussey Mountain at Mussers Gap, Center County, Pennsylvania. They comprise the shrubby growth within an old cleared area of twenty-five acres, now used for a pasture, which is surrounded by



FIG. 1. A dense growth of hawthorns as it appears in early spring.

a secondary growth of oak trees. In certain areas the hawthorns are close together and form a very dense growth, as shown in figure 1. The cedars and hawthorns are often found associated as shown in figure 4. The majority of the cedars, however, are in rather restricted groups surrounding the hawthorns. Thirteen specimens of hawthorns have been identified in this area. Several trees of *Malus glaucescens* have been found also adjacent to this

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section. Whatever the conditions, they have been very favorable for the prolific reproduction of the hawthorns and illustrate an interesting development of recognized species.

With the close association between the two hosts favorable conditions are present for the development of *Gymnosporangium* rusts. The following species are found established: *Gymnosporangium germinale* (Schw.) Kern, *Gymnosporangium globosum* Farlow, and *Gymnosporangium Juniperi-virginianae* Schw. These three species are found severely infecting the above mentioned hosts.



FIG. 2. Upper portion of a hawthorn showing the numerous hypertrophied branches as the result of infection of *G. germinale*.

The telial infection of *G. germinale* which occurs upon the trunks and branches of the cedars is most prevalent on the young growth, which is often completely girdled. On the hawthorns the most serious infection is with this rust. The young growth, modified branches, and terminal buds present abnormal hypertrophied developments when infected, as shown in figure 3. Severely infected trees with this species of rust present, from a distance, an appearance similar to a black-knot infection on

plums. Figure 2 shows the upper growth of a hawthorn in the early spring with the numerous hypertrofied branches as the result of previous infection. On the larger branches the hypertrofies indicate perennial character of the rust infection. The aecia on the branches always preceed the appearance of the aecia



FIG. 3. A branch showing the hypertrofied development of the young growth, modified branches and terminal buds as the result of infection by *G. germinale*.

on the fruit of the hawthorns. Infection with *G. germinale* on the fruit of the hawthorns is most conspicuous and the fruits are usually completely covered with the cylindrical aecia.

Infection with *G. globosum*, which occurs on the leaves of the hawthorns, has been observed to cause partial defoliation. The aecia are also commonly found developing on the calyx lobes of

the fruits. The aecia of *G. Juniperi-virginianae* were found only on the fruit and leaves of *Malus glaucescens*.

Specimens of these rusts have been collected at different times within this area by Dr. F. D. Kern, Prof. C. R. Orton and the writer. The different species of *Crataegus* have been kindly identified by Prof. W. W. Eggleston. The following list includes



FIG. 4. An intimate association between cedar and hawthorn favorable for the development of the rusts.

those species of hawthorns not previously reported as hosts in North American Flora for *G. germinale* and *G. globosum*. There are ten additional species reported for *G. germinale* and six for *G. globosum*. The remaining species of hawthorns listed includes those not previously reported for Pennsylvania.

Through the kindness of Dr. J. C. Arthur I have secured the data regarding a collection which was not reported in North American Flora, but was collected previous to our collection at Mussers Gap, Center Co., Pennsylvania. The collection is in the exsiccati of Ellis, *North American Fungi 1084*, as *Gymnosporangium germinale* on *Crataegus coccinea* collected in West Chester, Pennsylvania.

Gymnosporangium germinale (Schw.) Kern

on

<i>Crataegus coccinea</i> ¹ L.	<i>Crataegus pausiaca</i> ¹ Ashe.
<i>Crataegus coccinioides</i> ¹ Ashe.	<i>Crataegus pruinosa</i> ¹ (Wendl.) Beadle.
<i>Crataegus Jesupii</i> ¹ Sarg.	<i>Crataegus punctata</i> ² Jacq.
<i>Crataegus macrosperma</i> ¹ Ashe.	<i>Crataegus straminea</i> ¹ Beadle.
<i>Crataegus Margaretta</i> ¹ Ashe.	<i>Crataegus succulenta</i> ¹ Schrad.
<i>Crataegus neofluvialis</i> ¹ Ashe.	

Gymnosporangium globosum Farlow

on

<i>Crataegus Calpodendron</i> ¹ Borekh.	<i>Crataegus Margaretta</i> ² Ashe.
<i>Crataegus coccinea</i> ² L.	<i>Crataegus neofluvialis</i> ¹ Ashe
<i>Crataegus coccinioides</i> ² Ashe.	<i>Crataegus pruinosa</i> ² (Wendl.) Beadle.
<i>Crataegus Crus-galli</i> ² L.	<i>Crataegus straminea</i> ¹ Beadle.
<i>Crataegus Jusupii</i> ¹ Sarg.	<i>Crataegus succulenta</i> ¹ Schrad.
<i>Crataegus macrosperma</i> ¹ Ashe.	

Gymnosporangium Juniperi-virginianae Schw.

on

*Malus glaucescens*² Rehder.

STATE COLLEGE,
PENNSYLVANIA.

¹ Species not previously reported in North American Flora.

² Species not previously reported from Pennsylvania.